

USER MANUAL

COMPACTRIO

ARINC 429 RX/TX Modules

9429RX / 9429TX-HS / 9429-LS

9429RX	ARINC 429 RX	Art.Nr. 85076
9429TX-HS	ARINC 429 TX highspeed	Art.Nr. 85077
9429TX-LS	ARINC 429 TX lowspeed	Art.Nr. 85078



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1. IMPORTANT INSTRUCTIONS

Please read all instructions carefully before the 9429RX/9429TX-Modul is installed into a cRIO chassis or connected to other equipment!

1.1 INITIAL INSPECTION

Check that the shipment is complete and note whether any damage has occurred during transport. If the contents are incomplete or there is damage, file a claim with the carrier immediately, and notify the SET GmbH service contact to facilitate the repair or replacement of the module. The address is listed in the back of the manual.

The following parts should be included in the shipment:

- ✓ 9429RX- bzw. 9429TX-module
- ✓ CD-ROM with driver software and application examples
- ✓ User manual

1.2 SAFETY INSTRUCTIONS

1.2.1 MODULE FAILURE



Do not install the module into a cRIO chassis when the module is obviously damaged:

- physical damage
- lose parts inside the module
- it does not function any more

1.2.2 IMPERMISSIBLE APPLICATIONS



The module is designed for laboratory use. Installing or operating the module in explosive or hazardous environments is not permissible and may result in serious injury or death!

1.2.3 MODULE INSTALLATION AND REMOVAL



Hot Surface!

The module may be hot. Touching the module may result in body injury

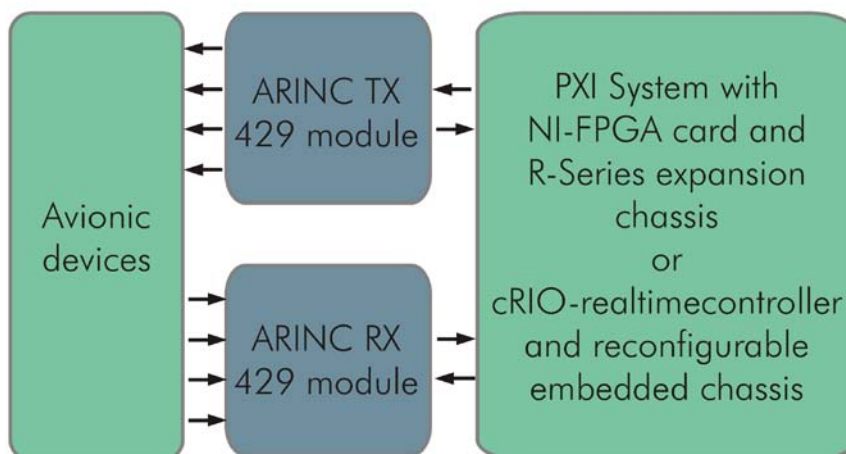
1.2.4 ELECTRICAL CONNECTIONS



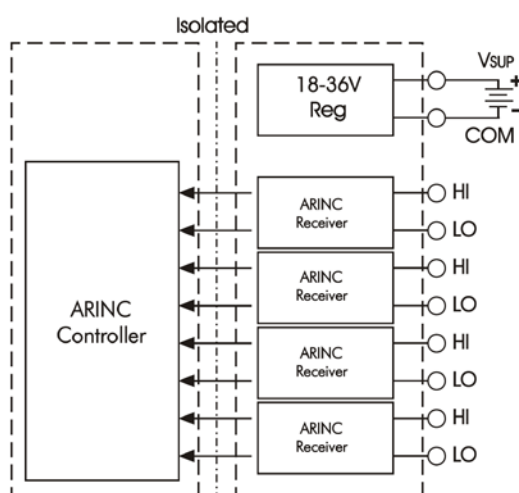
The module is not designed to isolate voltage levels of more than 50V_{DC}. Do not exceed the voltage levels according to the technical specifications. Not following this instruction may result in module damage and serious injury or death!

2. MODULE OVERVIEW

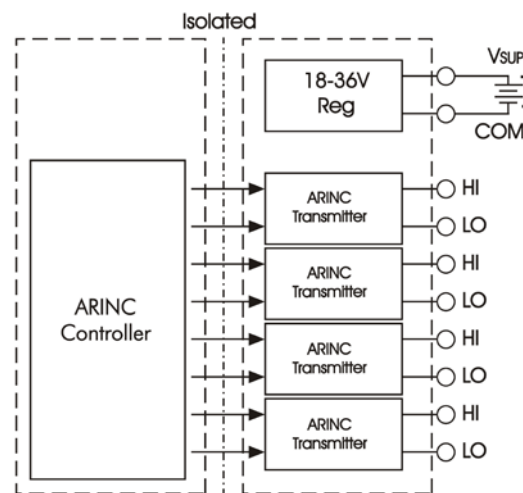
The 9429RX and 9429TX modules are highly versatile ARINC429 bus communication modules. The four-channel receiver module 9429RX is compatible for both, high and low speed operation mode whereas the four-channel transmitter module 9429TX-LS is a low-speed module and the 9429TX-HS is a high-speed module. All module channels are independently configurable.



The 9429RX/9429TX modules accept a wide voltage supply range from 18V to 36V and provide galvanic isolation between the cRIO rack and the bus interface. The module is operable within the NI cRIO real time environment and can also be plugged into a NI R-series expansion chassis with PCI / PXI FPGA card. Included in delivery are all drivers required for the cRIO systems and LabVIEW/TestStand integration examples.



ARINC 9429RX Module



ARINC 9429TX-LS/9429TX-HS Module

3. GETTING STARTED

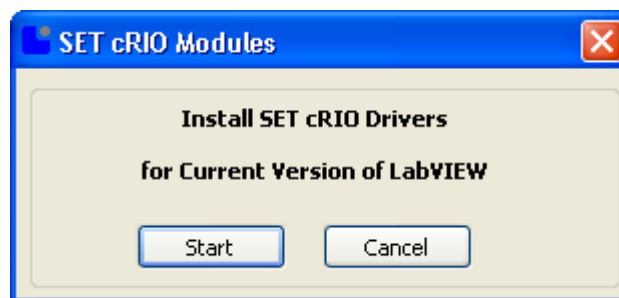
3.1 SOFTWARE-INSTALLATION

Before the 9429RX/9429TX module may be used in a LabVIEW project the driver software must be installed. To do this use the 9429RX/9429TX CD-ROM and follow the following instructions.

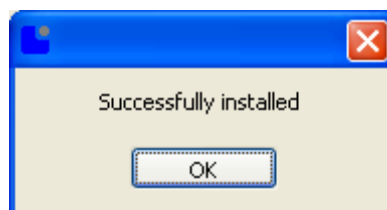
To start the installation process, execute the „setup.exe” program on the CD-ROM.



Click the start button to confirm the software installation.



When the installation is completed successfully, the following message appears:



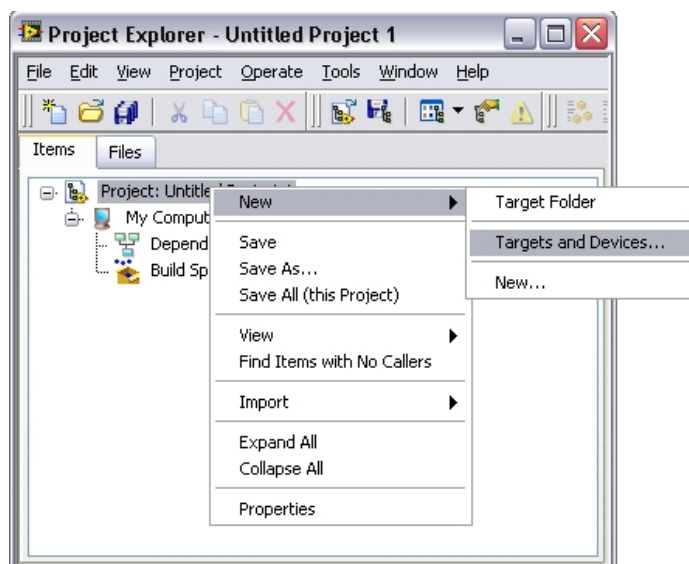
The host system is now ready for use the 9429RX/9429TX module in a LabVIEW project.

3.2 9429RX/9429TX COMPACTRIO LABVIEW DRIVERS

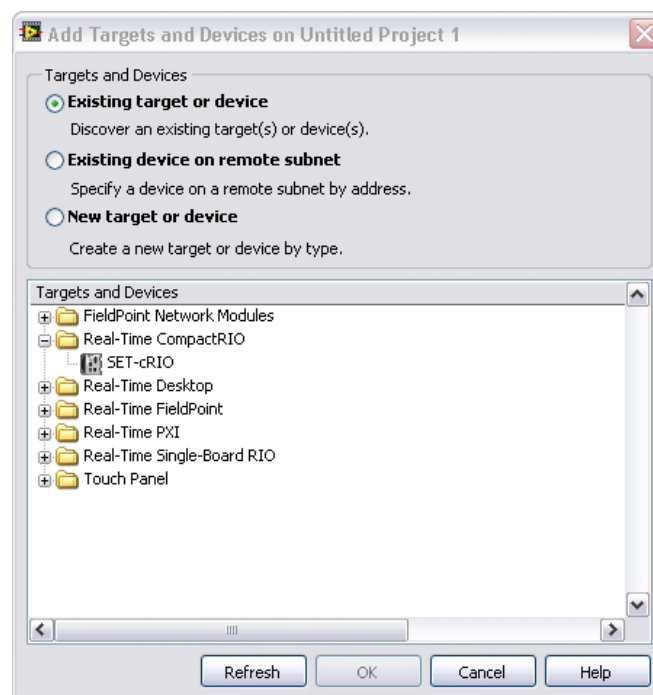
To use of the CompactRIO RDK9314 driver software LabVIEW 8.5 (or higher) must be installed. The driver software is compatible with all SET cRIO ARINC module types.

3.2.1 IMPLEMENTATION OF AN cRIO ARINC MODULE INTO A LABVIEW PROJECT

1. First, a new (empty) project must be defined. Alternatively, an existing project may be used. The example below demonstrates the setup of a new project.
2. The cRIO realtime is added by use of the projects context menu.



3. Now, the applicable cRIO realtime must be selected:

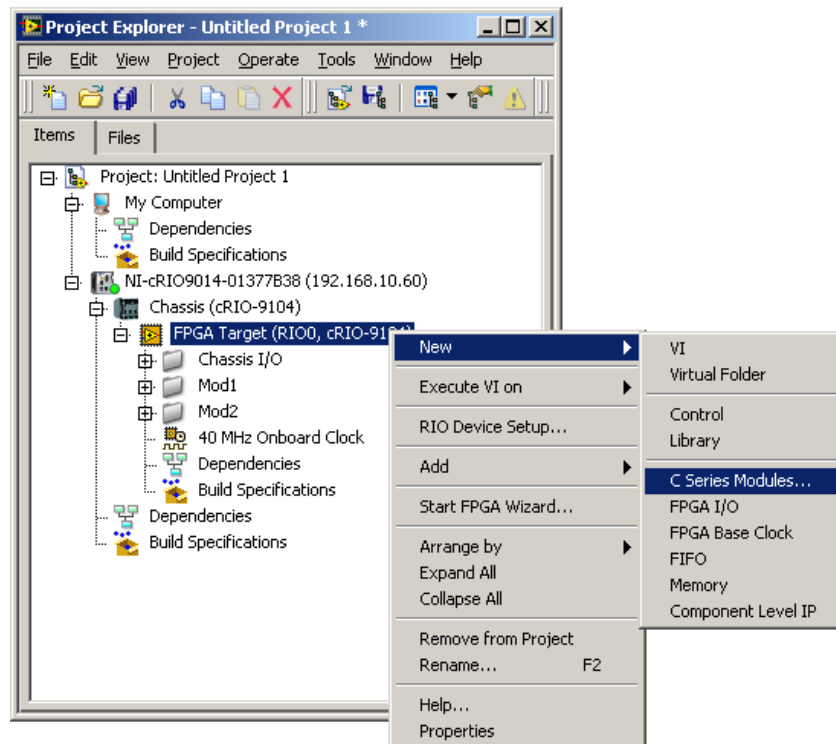


To setup the system for individual FPGA VI applications the LabVIEW FPGA interface must be selected as demonstrated below.

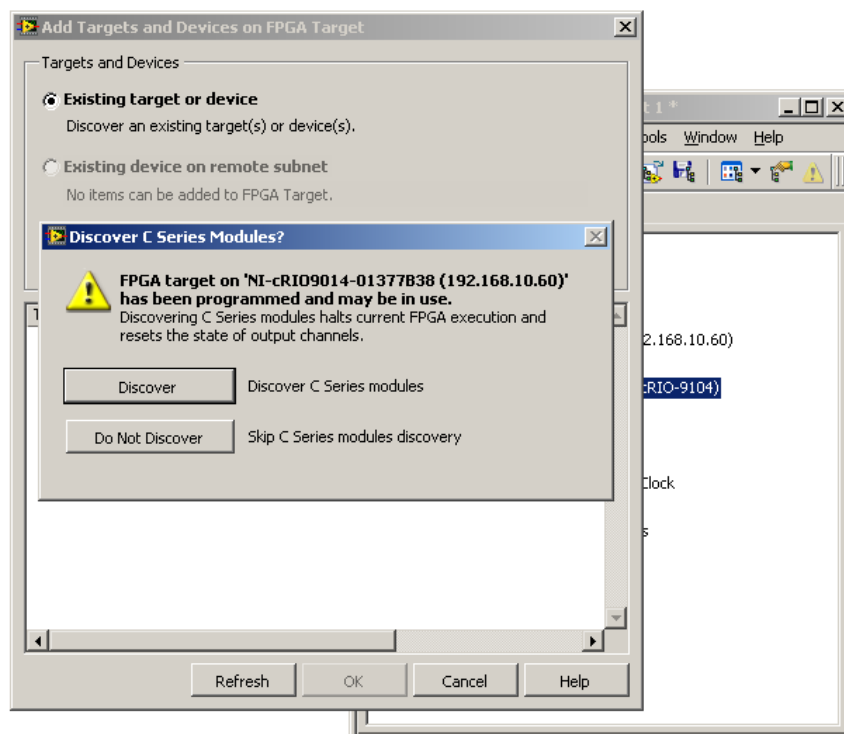


If a 9429RX/9429TX module is already plugged into the chassis it will be added automatically and step 4 can be jumped over.

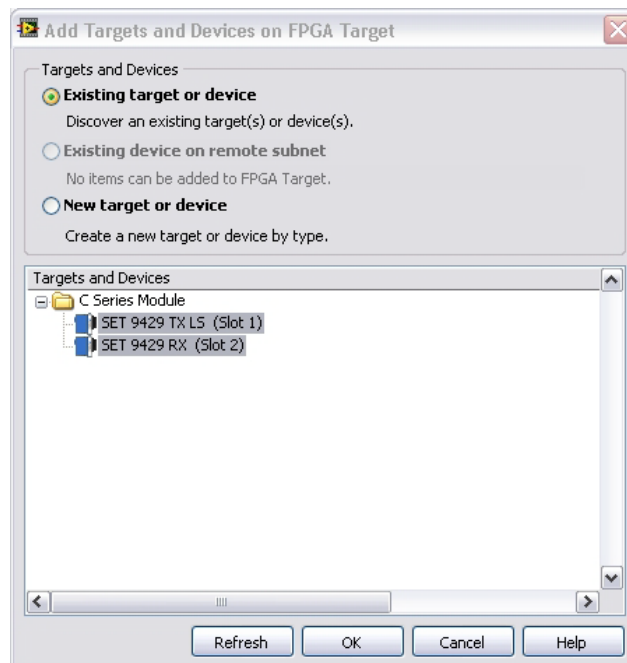
4. To manually add a new FPGA target to a (new or existing) project the context menu is applied shown below.



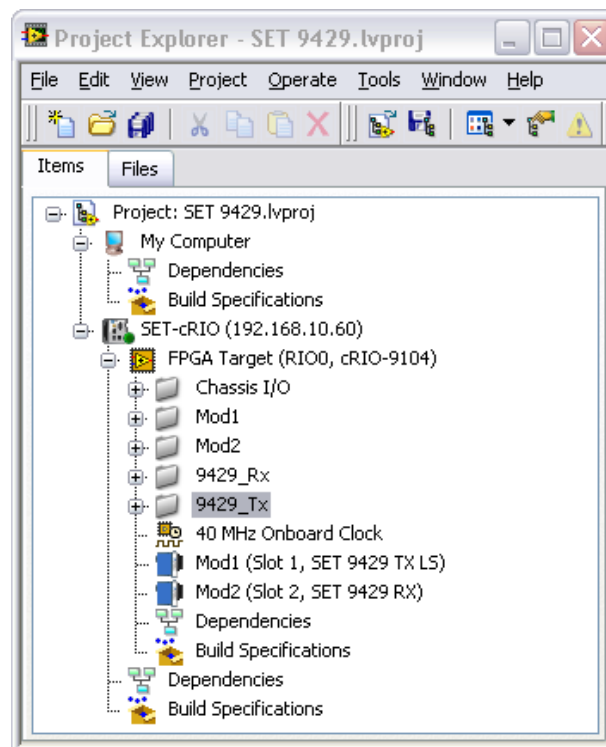
5. To discover the FPGA chassis for modules the option "Discover" must be clicked:



6. The project relevant modules must now be selected:



7. The project tree components are now arranged as shown below:



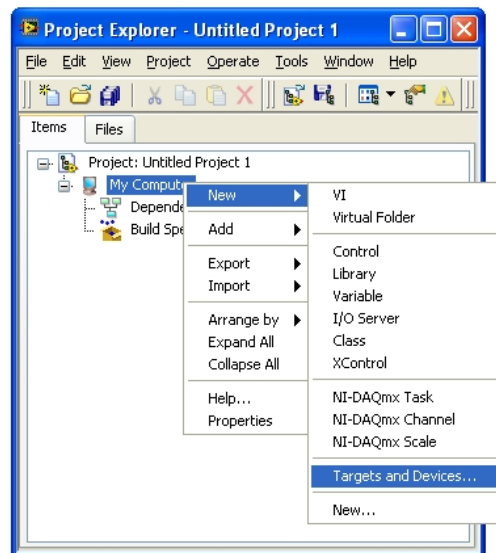
The project is now prepared to implement the driver SubVI's. To do this, the instructions according to paragraph 3.2.3 must be followed.

3.2.2 USING THE MODULE TOGETHER WITH A NI PCI/PXI -FPGA-CARD

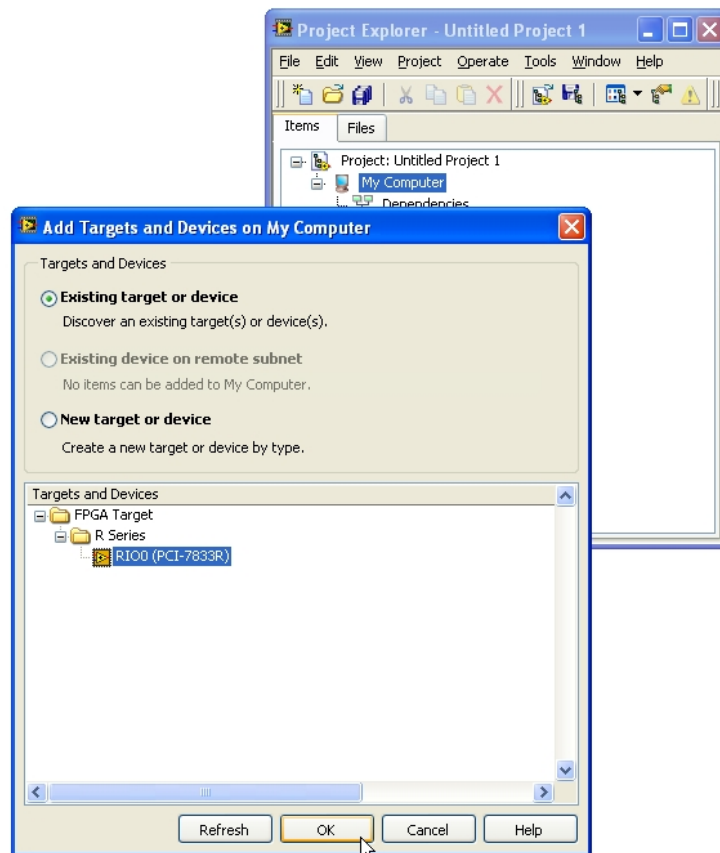
Note that the drivers are also compatible when the module is operated in a NI R-Series Expansion Chassis.

The most simple alternative to implement the modules into a new project is to copy the drivers from the example project into the new project. To copy the driver files use the “drag and drop” option, but make sure to press the STRG button during this operation in order not to remove the drivers from the example project.

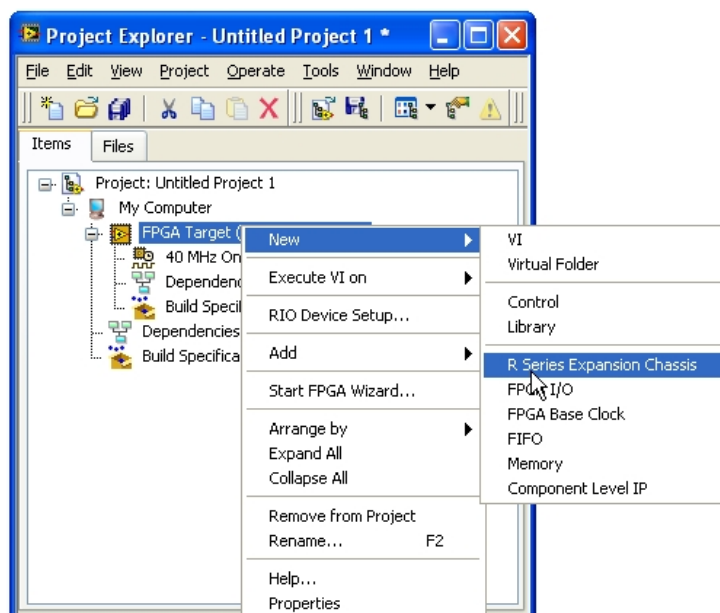
1. Creating a new project in LabVIEW
2. Adding the FPGA target to the new project.
To do this, „My Computer“ New >> Targets and Devices... “ must be selected.



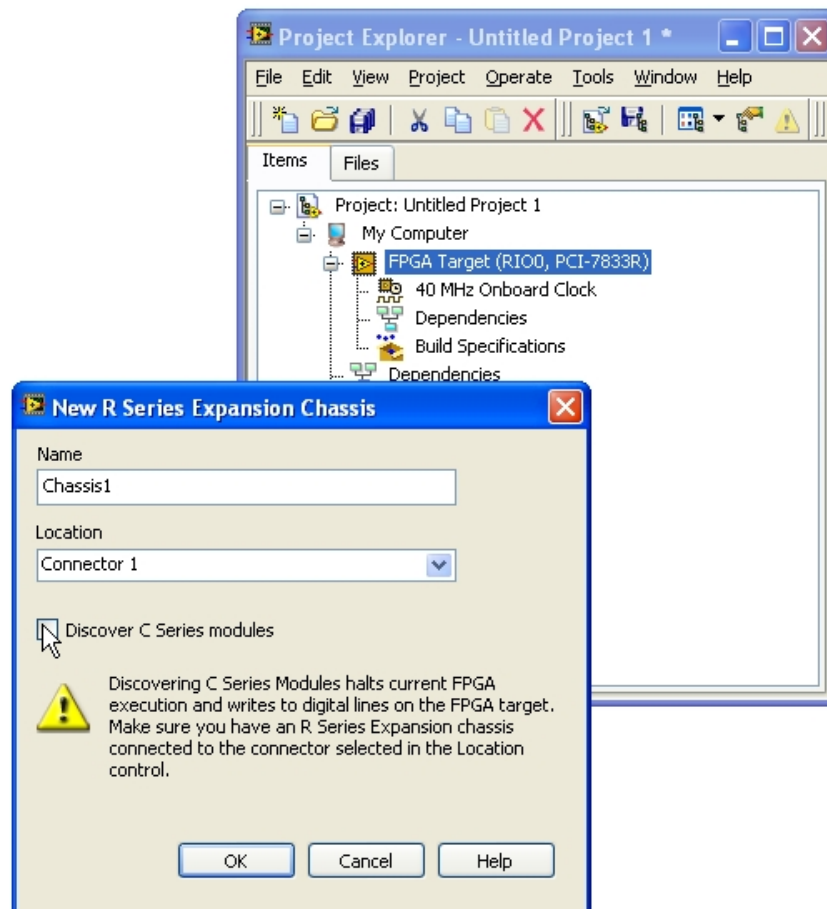
Now, the new target must be selected and confirmed with “OK”.



3. The example below demonstrates, how the FPGA target (a PCI-7833R card) is added to an R-Series Expansion Chassis by use of the FPGA context menu.



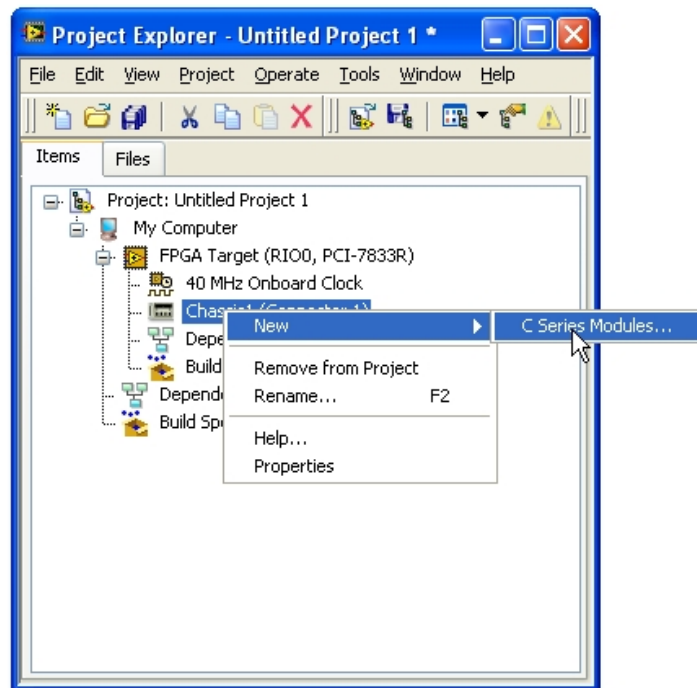
4. Selecting the R-Series Chassis interface:



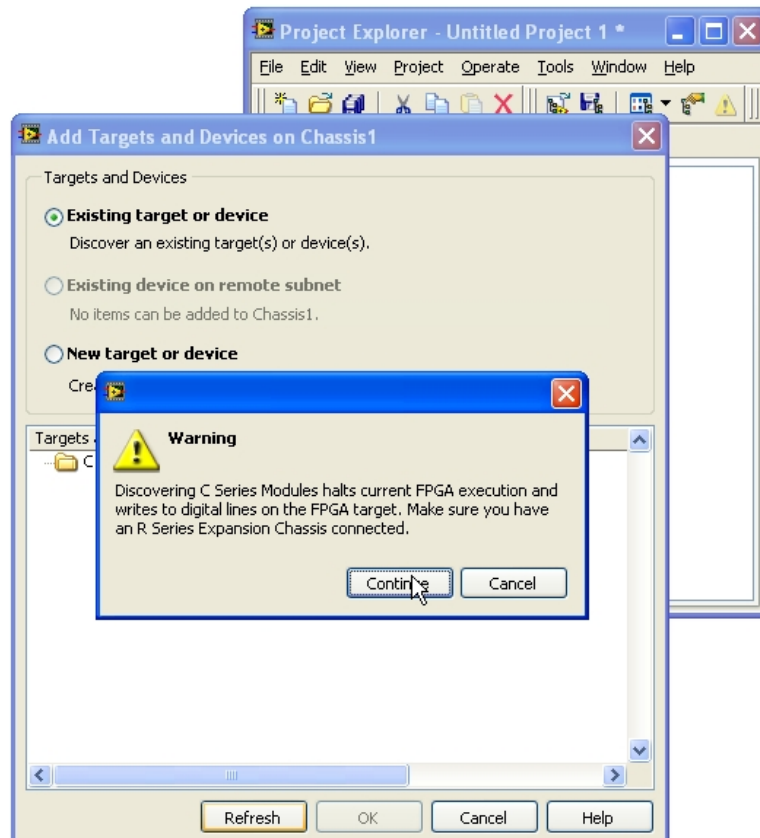
When option „Discover C Series modules“ is checked, the chassis automatically searches for the c-series modules. The example demonstrates the manual mode and hence this option is not checked in the screenshot above.

5. Adding Modules:

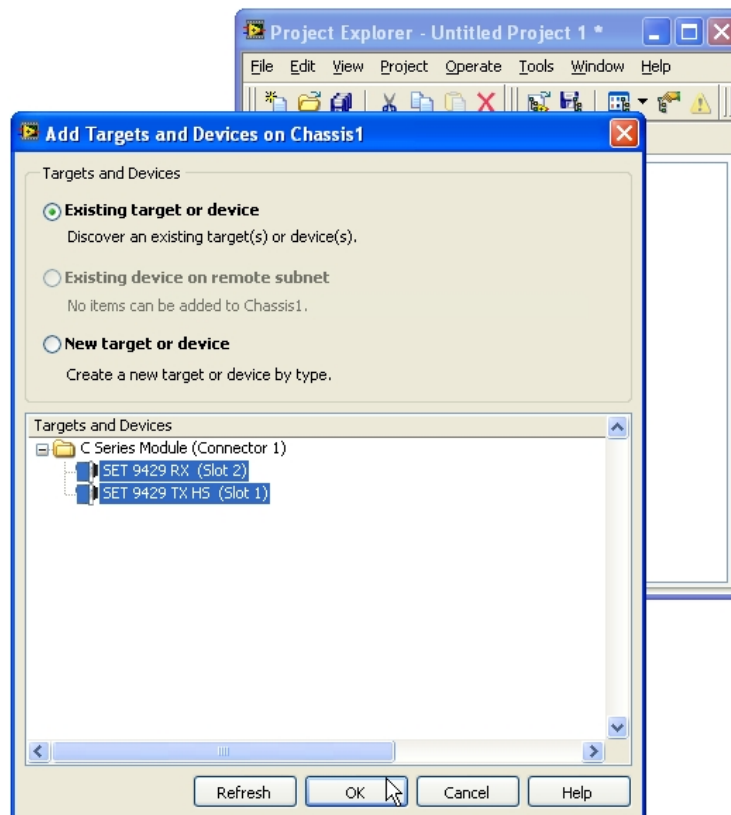
The context menu is now used to add the c-series modules as demonstrated below.



6. The screenshot explains how to select „Existing target or device“. A warning instruction then pops up which must be confirmed.

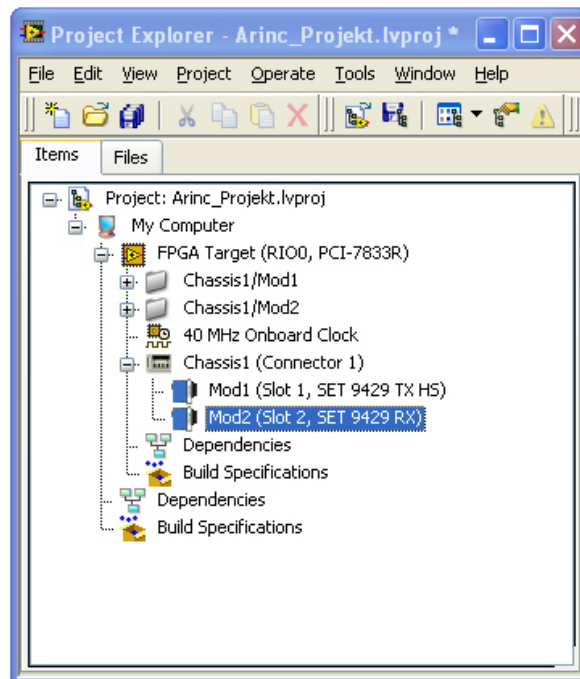


7. Now, the modules will be detected by the chassis and can be added to the project.

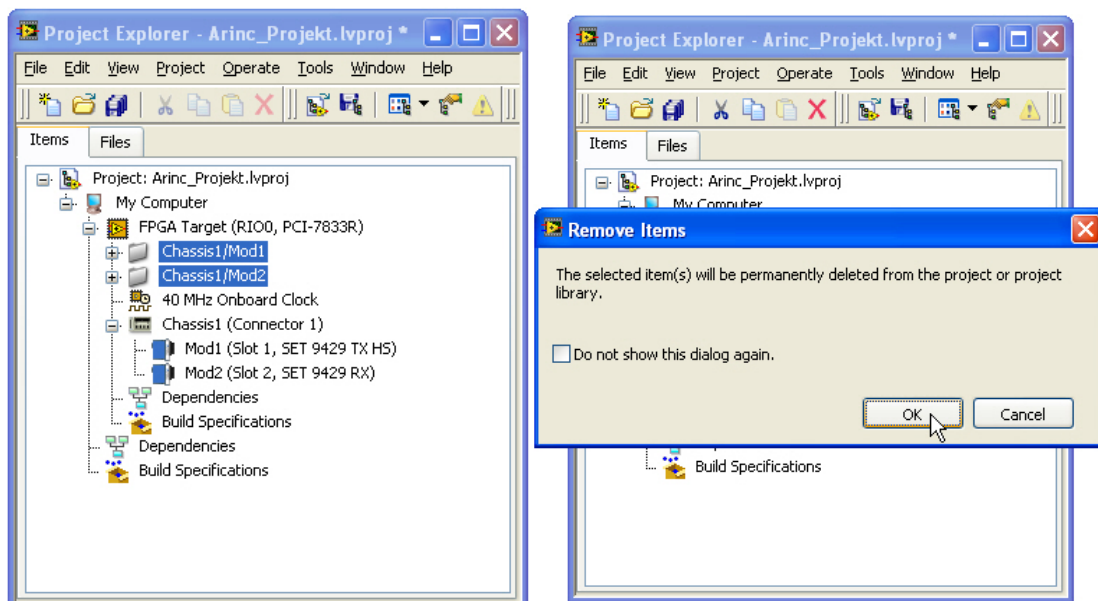


8. To make sure that the driver recognizes the modules, the module names must be adapted. The module name can be changed by simply pressing the F2 function key. The module names must be changed in that way to re-name the slot 1 module to "Mod1", slot 2 module to "Mod2", etc.

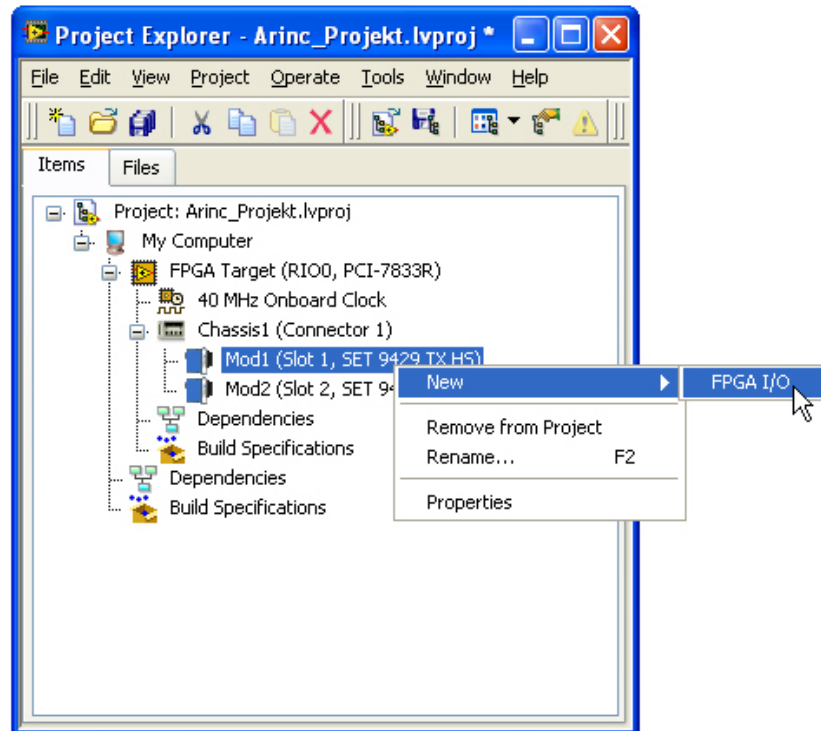
9. When the re-naming process is complete, the project should look as follows:



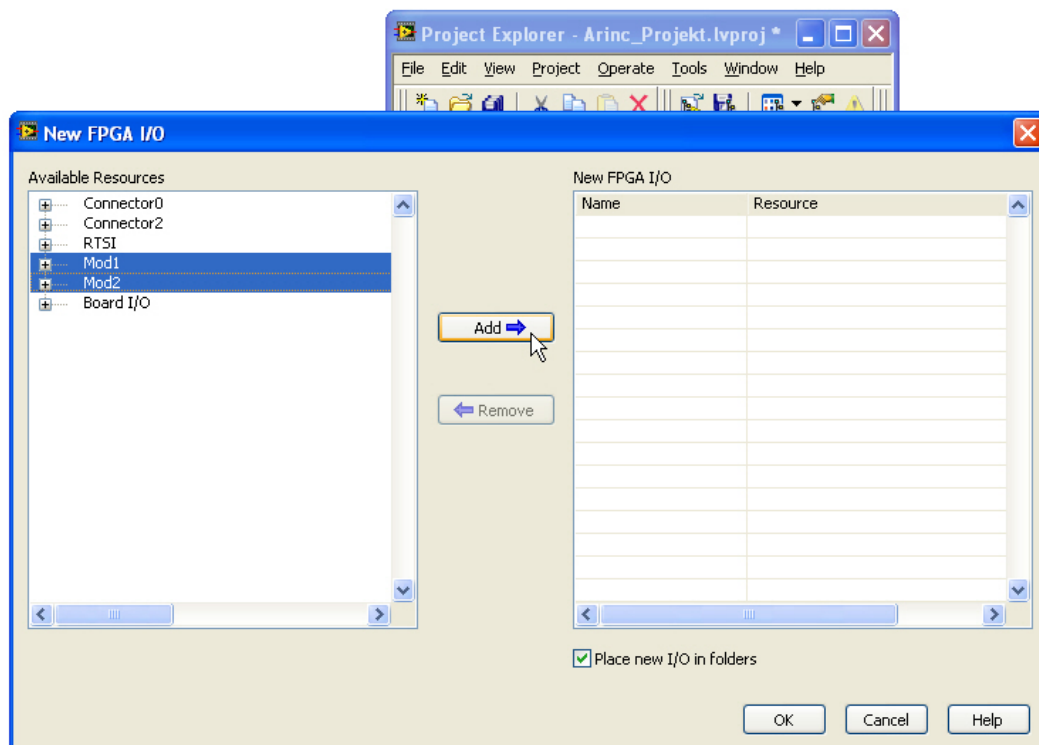
10. The virtual folders Chassis1/Mod1 must now be erased by selecting the folder and pressing the “delete” key:



11. The FPGA I/Os must now be added. This is done by use of the context menu of the applicable module.



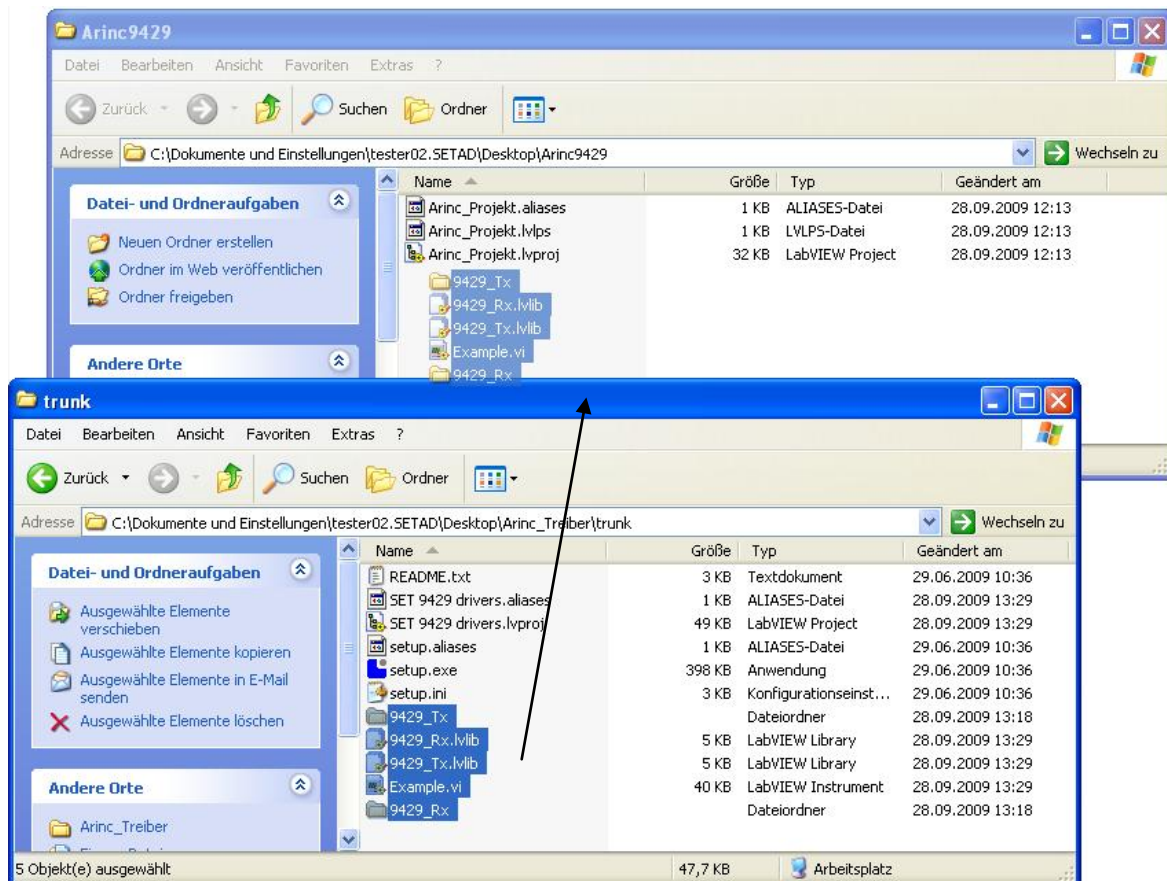
The required FPGA I/Os are now selected and added with „Add →“. Note that that it is possible to execute this instruction with a multiple selection.



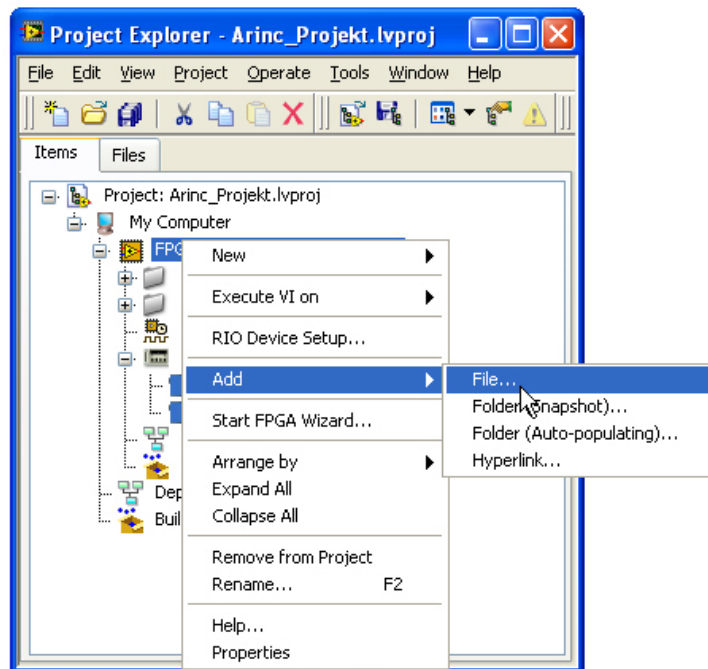
The project is now prepared to add the modules SubVI's which are the actual module interface. To complete the whole process the project should now be saved.

3.2.3 EMBEDDING THE SUBVI'S TO COMMUNICATE WITH THE 9429RX/9429TX-MODULE

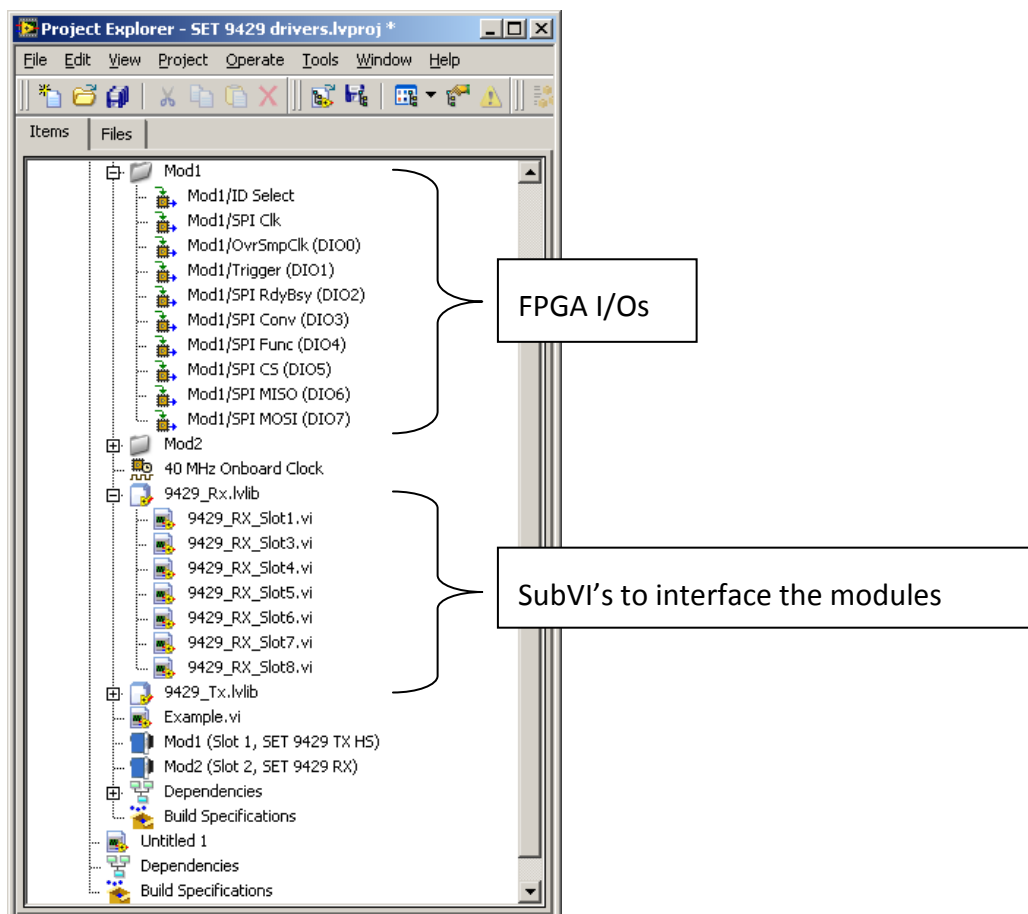
1. It must be ensured that a project with the correct structure exists. This is illustrated in the previous paragraphs.
2. The following folders must now be copied into the project:
(Note that the folders are available on the CD-ROM)
 - 9429_Rx and 9429_Rx.lvlib → for the ARINC RX modules
 - 9429_Tx and 9429_Tx.lvlib → for the ARINC TX high- / lowspeed modules
 - Example.vi to simplify the getting started



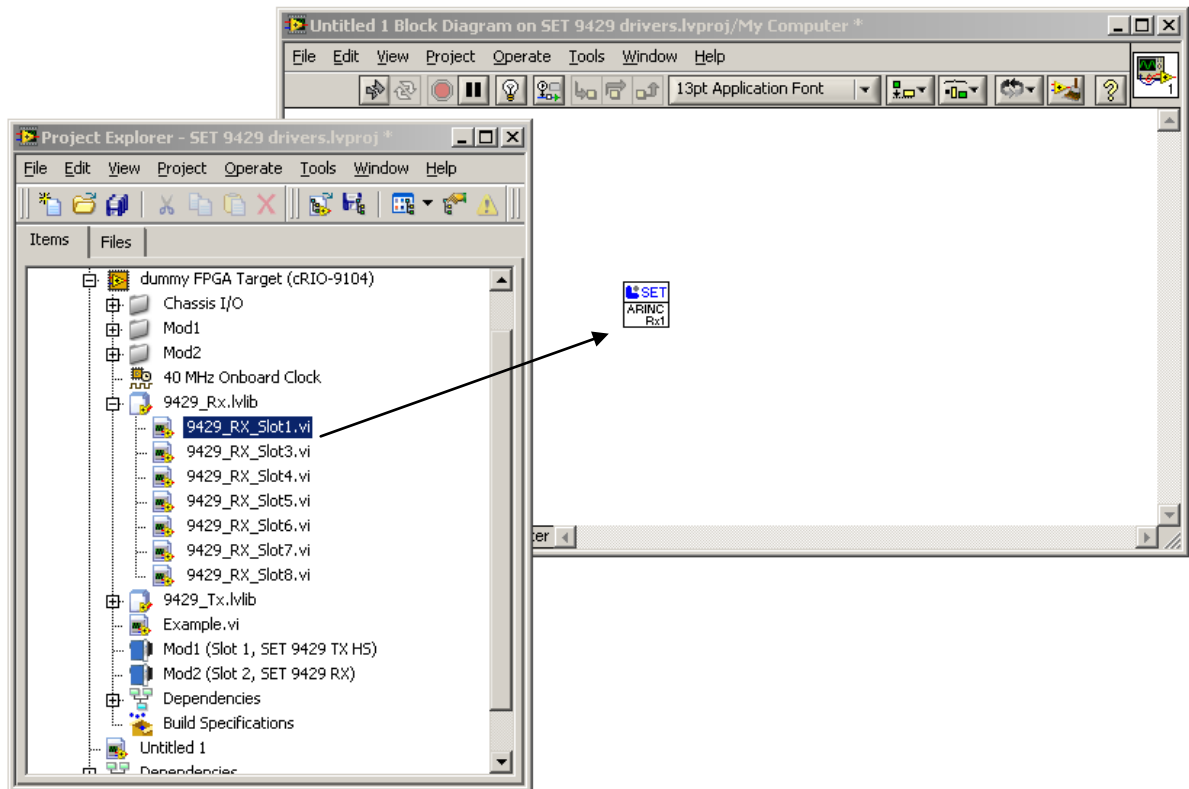
3. The *.lvlibs and the example.vi are now added to the project via the context menu of the FPGA target. Note that the actual FPGA target type (cRIO, PCI, or PXI target) is not relevant for this action. The example uses a PCI FPGA target.



4. The project is now ready for use and the example can be executed:

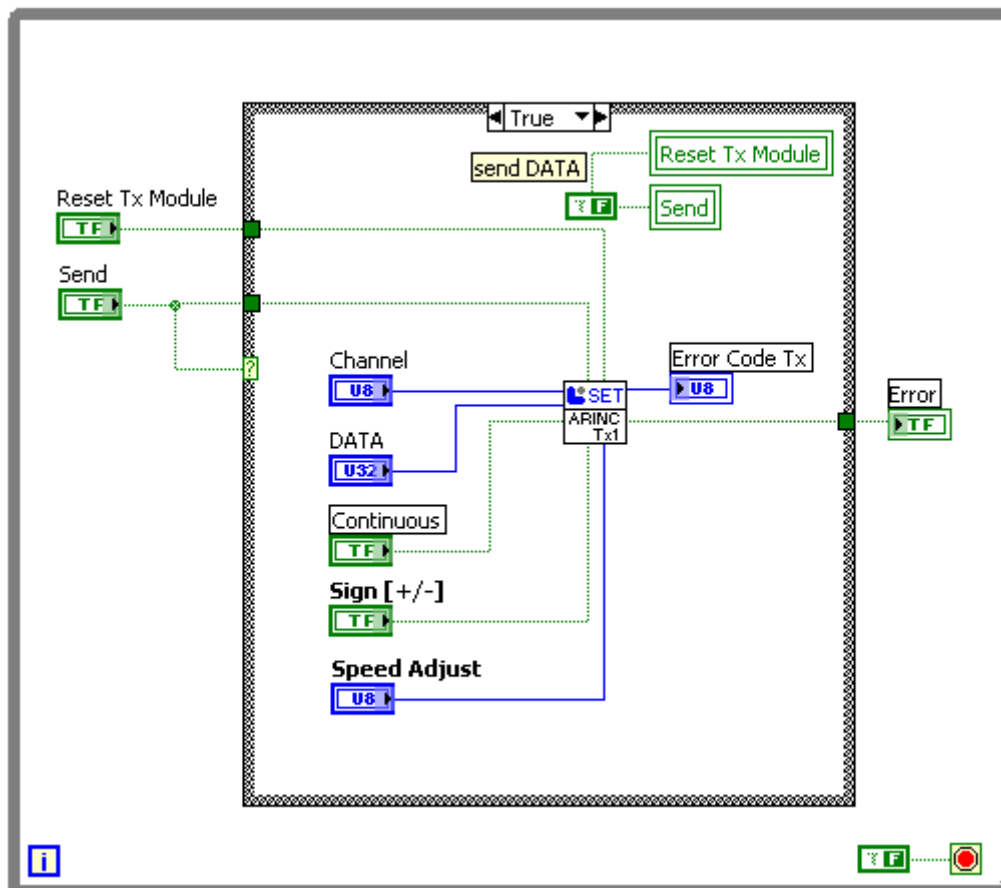


5. With „drag and drop“ the SubVI's can be pulled from the project explorer into theVI:



3.2.4 ARINC 9429 TX MODULE

3.2.4.1 ARINC TX SubVI DESCRIPTION



The ARINC TX SubVI uses the following interface:

- Inputs:
 1. Channel: Identifies the telegrams transmission channel
 2. Data: 32bit ARINC429 telegram
 3. Continuous: Enables repetitive telegram transmission
 4. Sign [+/-]: Adjusts the transmission bit rate
 5. Speed Adjustment: Adjusts the transmission bit rate similar to 4.
- Outputs:
 1. Error Code TX : Actual telegram error code

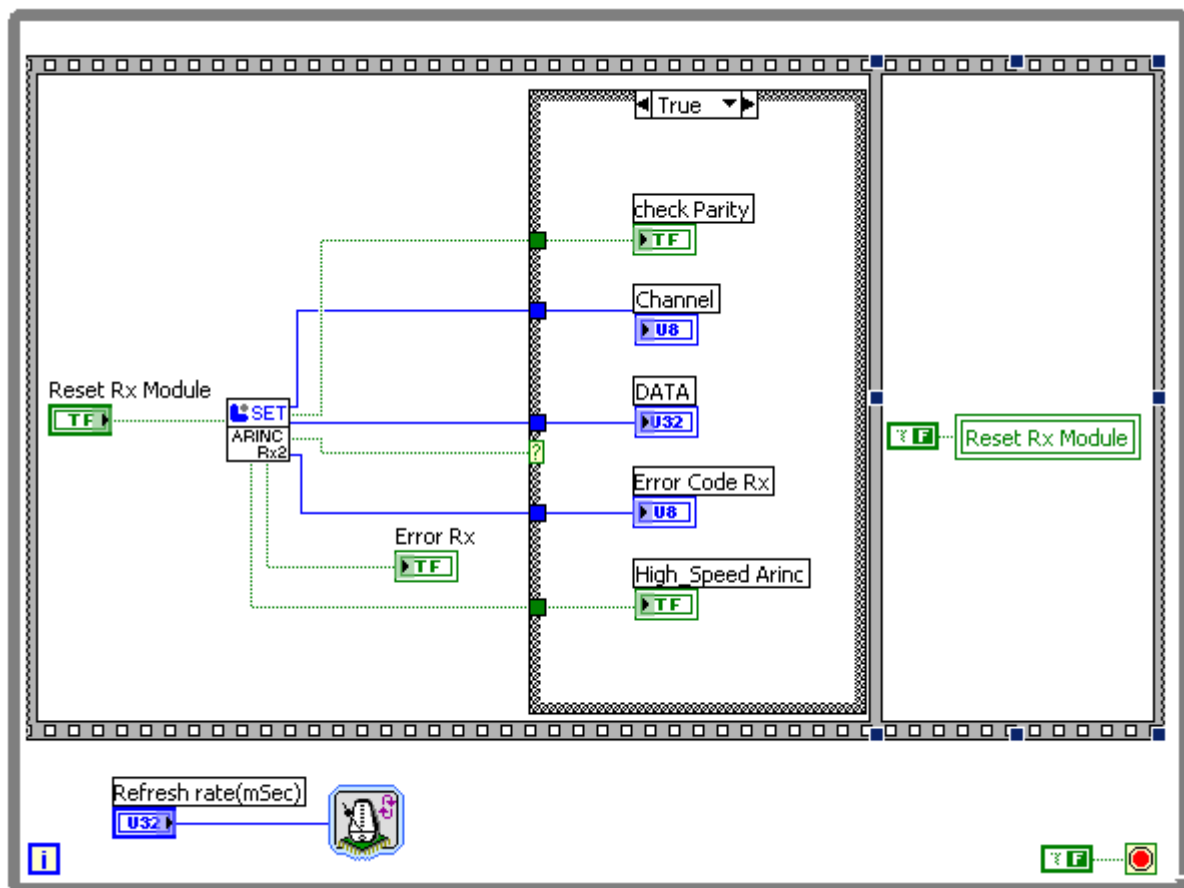
Error Code	Meaning	Reason
0000	No fault	-
0001	Parity fault	Parity check false

0010	Identification byte error (0xX5)	Identification byte not correct
0011	Byte 6(0xFF) error	SPI Timing
0100	Last telegram faulty	SPI Timing
0101	FIFO overflow	Telegram transmission rate to high

2. Error: Error flag (boolean)

3.2.5 ARINC 9429 RX MODULE

3.2.5.1 ARINC RX SUBVI DESCRIPTION



The ARINC TX SubVI uses the following interface:

- Inputs:
 - Reset RX Module: Module reset (internal FIFOs are cleared)
- Outputs:
 - Check Parity: Parity check ok

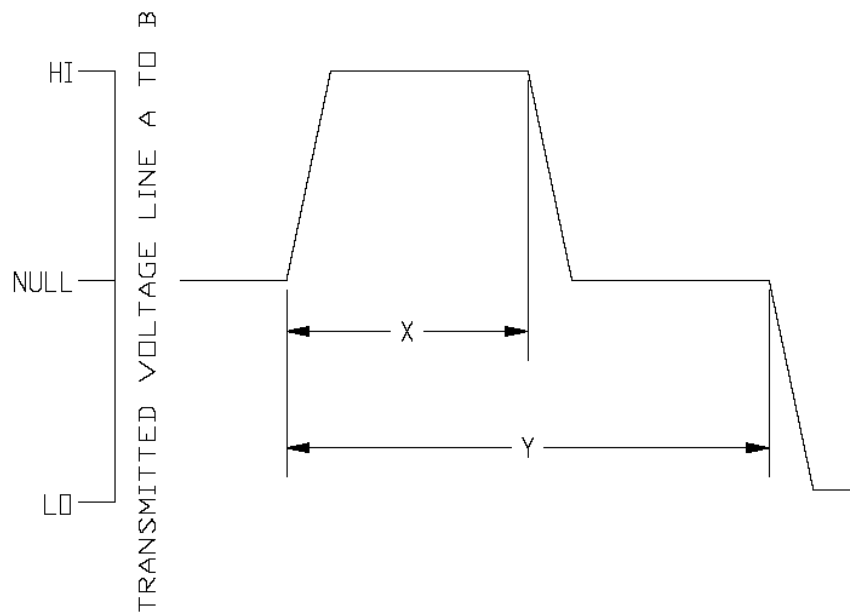
- 2. Channel: Receiving data channel
- 3. DATA: 32 bit telegram
- 4. Error Code Rx: Error code

Error Code ARINC	Meaning	Reason
0000	No fault	-
0001	Signal spikes	Telegram faulty due to signal noise
0010	Telegram bit length error	ARINC telegram data bit length not correct
0011	Telegram data length error	ARINC telegram data length not correct
0100	Telegram Data error	-
0101	Frame gap time error	Telegram repetition speed to high
0110	Multiple faults	Combination of different error codes

Error Code SPI	Meaning	Reason
00	No fault	-
01	Parity fault	Parity check failed
10	Telegram not complete	Telegram identification byte transmission faulty
11	-	-

- 5. Error Rx: Error flag
- 6. High Speed ARINC: Indicates the reception of a high speed telegram

3.3 ARINC429 TELEGRAM BIT TIMING

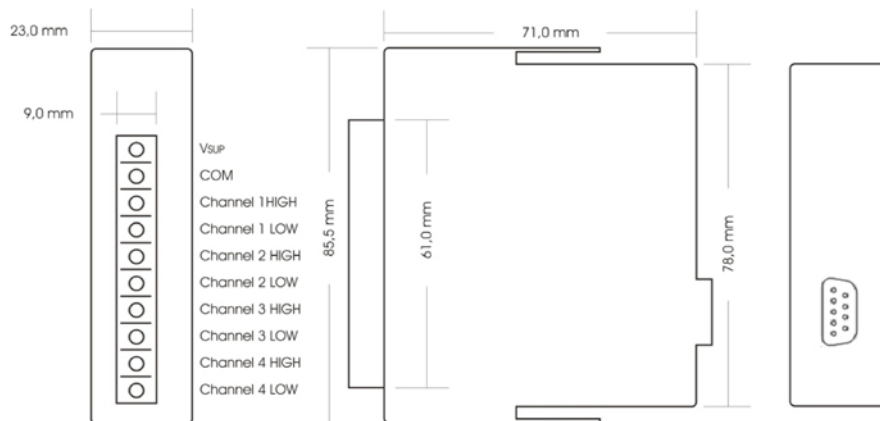


	High speed	Low speed
Bit rate	100kBit/s	12.5 – 14.5kBit/s
Time Y	10μs ±2.5%	80μs ±2.5%
Time X	5μs ±5%	40μs ±5%
Rise Time	1.5μs ±0.5μs	10μs ±5μs
Fall Time	1.5μs ±0.5μs	10μs ±5μs

4. TECHNICAL SPECIFICATION

4.1 HOUSING

- NI CompactRIO 9952 Standard Housing
- Dimensions: appr. 71mm x 72mm x 23mm



4.2 EXTERNAL POWER SUPPLY

- Supply Voltage: $+18V_{DC}$ to $+36V_{DC}$ ($+V_{SUP}$ to COM)
- Current Consumption: max. 50mA at $28V_{DC}$ without bus load

Caution:

The external power supply input is isolated from the cRIO chassis signals with a maximum isolation voltage of $50V_{DC}$. Note that the ARINC429 bus is galvanically connected to the external power supply.

4.3 ARINC 429 I/O CHARACTERISTICS

9429RX Module:

- Voltage range: $\pm 10V$
- Z_{in} : 300kOhm
- Data rates (Low-/High-speed): 10kbit ... 100kbit (auto detection)
- Galvanic isolation: max. $50V_{DC}$ (ARINC I/Os – cRIO I/Os)

Caution:

The signal inputs can be damaged, when the input voltage exceeds a limit of 40V peak.

9429TX-LS/HS Module:

- Output voltage: $\pm 10V$

- Output current: 50mA max.
- Data rate: 12.5kBit (LS-Module)
100kBit (HS-Module)
- Galvanic Isolation: 50V_{DC} (ARINC I/Os – cRIO I/Os)

Caution:

The signal outputs can be damaged, when a power source is connected to its terminals.

4.4 ENVIRONMENTAL CONDITIONS

- Temperature Range: -40°C to +70°C (operational)
-40°C to +85°C (storage)
- Humidity: 10% – 90% relative, non-condensing

4.5 CONNECTOR PIN-OUT

User Interface Connector (10-pin screw terminal connector):

Pin	Function
1	V _{SUP} (external supply voltage, positive terminal)
2	COM (external supply voltage, negative terminal)
3	ARINC429 Channel 1 HIGH
4	ARINC429 Channel 1 LOW
5	ARINC429 Channel 2 HIGH
6	ARINC429 Channel 2 LOW
7	ARINC429 Channel 3 HIGH
8	ARINC429 Channel 3 LOW
9	ARINC429 Channel 4 HIGH
10	ARINC429 Channel 4 LOW

5. MODULE MAINTENANCE

No maintenance is required for the ARINC 9429RX/TX modules.

6. SERVICE ADDRESS

For technical support contact the SET service address:

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